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Rhodora

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 34. June, 1932. No. 402.

A NATURAL CYPRIPEDIUM HYBRID FROM WISCONSIN

A. M. Fuller

In the spring of 1930, Dr. E. P. Andrews of Portage reported to the writer that he had observed cream-colored cypripediums at a station near Swan Lake. They appeared to him to be intermediate between *Cypripedium candidum* and *C. parviflorum* and he thought that they might possibly be hybrids. On June 2, 1931, the writer, accompanied by Dr. Andrews and Mr. Harold Staffeld, visited the locality where these cypripediums had been found.

The locality is adjacent to Swan Lake, about five miles east of Portage, Columbia County, Wisconsin. Swan Lake is but an enlargement of the channel of the upper Fox River. A wide margin of meadow, in many places underlain by marl, borders the lake on the west and east, while the soil of the higher land and ridges is sandy. Here, *Polygala Senega, Tradescantia reflexa, Lupinus perennis, Geum triflorum* and *Phlox pilosa* were observed.

The transitional area between the higher land and the meadow was occupied by *Cypripedium candidum, Hypoxis hirsuta* and *Valeriana edulis*. A short distance in the meadow from the transition zone, *C. parviflorum* grew very abundantly. In the *C. candidum* zone, only an occasional plant with a cream-colored lip was found. In the *C. parviflorum* zone over a hundred plants were found that had white or cream-colored lips, madder-purple petals and sepals, and spotted triangular staminodia. In the *C. parviflorum* zone there were at least three thousand typical *C. parviflorum* plants, a hundred or more plants that were intermediate and less than twenty-five typical *C. candidum* plants. The intermediate plants appeared to the writer to be hybrids.

We know that hybridization is of common occurrence in a number of plant families, and a large number of artificial or horticultural orchid hybrids are known. In Europe many natural hybrids have been described, many of which belong to the genera *Ophrys* and *Orchis*. In Europe, the habitats of the various species of orchids have not been so ruthlessly destroyed and consequently there has been an abundance of material for study. In this country, particularly where dairy farming is practiced intensively, it is a difficult matter to find undisturbed habitats which are suitable for the various species, hence the paucity of living orchid material for critical study. It is difficult, and in many cases, impossible to detect hybrids in herbarium material.

Four natural hybrids are listed in Professor Ames's Enumeration.[1] They are: × *Habenaria Andrewsii* (*H. lacera* × *H. psycodes*), × *Habenaria Canbyi* (*H. blephariglottis* × *H. cristata*), × *Habenaria Chapmanii* (*H. ciliaris* × *H. cristata*), and × *Spiranthes vernalis* (*S. cernua* × *S. gracilis*).

In regard to natural orchid hybrids, Professor Ames writes:[2] "Natural hybrids do not seem common among New England orchids, but intensive study may bring more to light. Often the characters which designate hybridity are extremely elusive, and hybrids are classed arbitrarily with the species to which they bear the closest resemblance. As a general rule orchids which hybridize freely give rise to progeny of an intermediate character, but when specific lines are closely drawn, and based on traits phylogenetically young, parental differences may not stand out with sufficient distinctness to attract special attention and so hybrids may well be overlooked."

All of the conditions which are necessary for hybridization appear to have been present at the Swan Lake locality. The two species, *C. candidum* and *C. parviflorum*, grow near each other in an open meadow, blooming at the same time. The numerous plants with intermediate characteristics give unmistakable evidence of being hybrids. The flowers of the two species are quite similar as far as shape and size are concerned and the position and shape of the stigma and anthers are also similar. As it was cloudy and even raining during the time of our visit no observations were made as to the abundance of bees which are instrumental in the transfer of pollen. It might be

[1] Ames, Oakes, "An Enumeration of the Orchids of the United States and Canada," American Orchid Society, Boston, Mass., 1924.

[2] Ames, Oakes, "Hybrids in Spiranthes and Habenaria," RHODORA, Vol. 5, p. 264. 1903.

well to mention that *C. parviflorum* has a much stronger fragrance than *C. candidum* while the hybrid has a fragrance perhaps even stronger than in *C. parviflorum.*

In Wisconsin, *C. parviflorum* has the following characteristics: plants 19–40 cm. high, 1–2 flowered; sepals and petals madder-purple; sepals ovate-lanceolate, 26–35 mm. long; petals lanceolate, 35–45 mm. long; lip orange-yellow, 20–27 mm. long, conspicuously striped on the interior with madder-purple lines, frequently with prominent splashes of madder-purple near the orifice; staminodium (Figure 1) triangular, often semi-cordate at base, 5 mm. wide, 8 mm. long, bright orange-yellow, often spotted with madder-purple near the apex; stigma roundish, 3 mm. wide, 5 mm. long.

C. parviflorum is found in meadows, bogs and thickets bordering bogs. In some places it occurs in abundance in eastern and northern Wisconsin. This species appears to be absent from the southwestern and western counties as far north as St. Croix County.

C. candidum in this region has the following characteristics: plants 16–28 cm. high, 1-flowered; sepals and petals greenish-yellow, usually striped with lines of madder-purple; sepals ovate to ovate-lanceolate, 24–30 mm. long; petals lanceolate, 25–35 mm. long; lip white, about 22 mm. long, striped on the interior with violet-purple lines; staminodium (Figure 5) oblong-linear, 3.5 mm. wide, 8 mm. long, orange-yellow, unspotted or sparingly spotted with madder-purple; stigma roundish, 3 mm. wide, 4 mm. long.

C. candidum in Wisconsin is found only in the southern counties where it grows in meadows and is frequently associated with *Valeriana edulis* and *Hypoxis hirsuta.* Fifty years ago this species grew in great abundance in numerous localities in southern Wisconsin. Today, most of these meadows are closely grazed or have been plowed and have given place to fields of cabbages, celery and onions. As far as the writer is aware, there are left at the present time in southern Wisconsin only four localities where this species occurs in any abundance at all. In each of these localities *C. parviflorum* grows either with *C. candidum* or in areas not far away. Both species appear to have a preference for neutral or alkaline soil (pH 7–8).

In reference to the occurrence of this hybrid elsewhere in Wisconsin, Mr. S. C. Wadmond of Delavan, Wisconsin writes: "On a visit to Mr. S. W. Faville, Lake Mills, Jefferson County, Wisconsin, May 31, 1931, Mr. Faville took us out into his wild flower garden and showed us a

cypripedium which was then in bud and which in both its foliage and floral characters was very suggestive of *parviflorum* but the lip instead of a golden yellow was a pale or lemon yellow and dried out in press a creamy white, very much the same as *candidum* looks in the herbarium. We went out to the low peaty meadow from which this plant had come and we found very much the same conditions existing that you describe at Swan Lake. This meadow is being drained and the cypripediums were having a hard time of it but in years gone by there was an adundance of both species in proximity and probably blooming at about the same time, just as you found them at Swan Lake. Mr. Faville was inclined to favor the theory of hybridity. I was a bit skeptical and never having read of any hybrids amongst our native cypripediums, I was inclined to call it simply a color variant. On looking at the two plants in the herbarium I am entirely convinced that they are the new hybrid." On June 4, 1931, the writer also visited Mr. Faville's wild flower garden. The clump of cypripediums to which Mr. Wadmond referred, was in full flower. They were intermediate forms and were similar to plants observed and collected at Swan Lake.

It is very likely that wherever *C. candidum* and *C. parviflorum* grow in the same vicinity, hybrids will be found. Since Dr. E. P. Andrews of Portage appears to have been the first person to call attention to this hybrid, it is fitting that it should bear his name.

Staminodia (× 2) of 1, CYPRIPEDIUM PARVIFLORUM from Polk County, Wisconsin, *M. P. M.* Cat. no. 70788; 2, 3, 4, × C. ANDREWSII from Swan Lake, Columbia County, Wisconsin, *M. P. M.* Cat. no. 70803; 5, C. CANDIDUM, from Swan Lake, *M. P. M.* Cat. no. 70801.

× CYPRIPEDIUM **Andrewsii**, hyb. nov. (*C. candidum* × *C. parviflorum*). Planta 16–40 cm. alta, 1–2-flora; foliis ovato-lanceolatis, acutis; sepalis petalisque subviridibus, valde colore fusco-purpureo suffusis; sepalis ovato-lanceolatis, 25–37 mm. longis; petalis lanceolatis, 30–40 mm. longis; labello 20–25 mm. longo, albo vel gilvo, intus manifeste violaceo-striato; staminodio 4 mm. lato, 9 mm. longo,

aurantiaco, triangulare vel semitriangulare, parte apicali insigniter maculis varisque fusco-purpureis ornato; stigmate subrotundo.

× Cypripedium **Andrewsii**, hyb. nov. (*C. candidum* × *C. parviflorum*). Plants 16–40 cm. tall, 1–2 flowered; leaves oval-lanceolate, acute; sepals and petals greenish, much suffused with madder-purple; sepals ovate-lanceolate, 25–37 mm. long; petals lanceolate, 30–40 mm. long; lip 20–25 mm. long, white to cream-colored, conspicuously striped on the interior with violet; staminodium orange-yellow, triangular to semi-triangular (Figures 2, 3 & 4), 4 mm. wide and 9 mm. long, marked in the apical region with spots and blotches of purple-brown; stigma roundish. Type sheet in the herbarium of the Milwaukee Public Museum, Cat. No. 70803, sheet I. June 2, 1931, Swan Lake, Columbia County, Wisconsin. Collected by A. M. Fuller and Harold Staffeld. A co-type specimen and an autochrome photograph have been deposited in the Gray Herbarium.

Mr. Stephen Kliman of the Milwaukee Public Museum made the drawings and supplied the Latin diagnosis. The writer is also indebted to Dr. N. C. Fassett, Mr. S. C. Wadmond, Dr. Ira Edwards and Mr. Gerald Teyen for looking over the manuscript.

Milwaukee Public Museum,
Milwaukee, Wisconsin.

BOTANICAL EVIDENCE OF A POST-PLEISTOCENE MARINE CONNECTION BETWEEN HUDSON BAY AND THE ST. LAWRENCE BASIN

David Potter

(*Continued from p. 89*)

Marine Submergence in the Hudson Bay Region

Bell, Low, Wilson, Tyrell and others have conclusively proven that a post-glacial submergence occurred in the Hudson Bay region, which covered a vast territory to the east, west, and south. This area is covered by a mantle of marine clays containing many fossils which are identical with those reported from the St. Lawrence Basin.

Table 3 gives a list of some of the localities where these marine fossils have been found. The stations of table 3 have been plotted on the accompanying large map and are indicated by solid black circles. Based upon the known fossiliferous areas, the extent of the marine invasion from James Bay has been shown to reach nearly to that of the St. Lawrence Basin. The area indicated is probably not

TABLE 3

Location	Height in feet above sea level		Authority
Round Bay, 125 miles from the mouth of Moose River	300	marine shells	Bell (5)
Missinabi Lake and along Missinabi and Moose Rivers	300	marine shells	Bell (8) McLean (46)
Nelson river, 54 miles upstream	200	marine shells	Bell (3, 4)
Nelson river, above the third Limestone rapid	200	marine shells	Bell (4)
Churchill river, 60 miles from its mouth	350	marine shells	McLean (3)
Kenogami river	450–500	marine shells	Bell (6, 7)
Little Churchill river	60	marine shells	Alcock (1)
Winisk river	350	marine shells	McInnes (45)
Mammamemmatawa	380	marine silts	Williams (65)

inclusive enough to show the outer margin of submergence, for Low (41), in his work along the east coast of James Bay, discovered sediments and terraces probably of marine origin up to at least 675 feet. In discussing this situation he states: "The evidence of stratified deposits of marine sands and clays along the valleys, near the mouths of the rivers on the east side of Hudson Bay, show that a subsidence of the land over 500 feet (and probably 700) took place after the period of glaciation." Bell (8) further supports this contention, for he says: "On the islands and shores all along the Eastmain coast, the 'raised' beaches are very conspicuous at all heights up to about 300 feet immediately near the sea, but, no doubt, higher ones would be found further inland."

The problem of finding fossil-bearing clays and sands in this region and farther southward is a difficult one due to the ground-cover, which is for the most part boggy or heavily wooded, with considerable accumulation of peat. Even though much of this area has been explored by Canadian geologists, their work has been for the most part concerned with the economic aspects of geology and Pleistocene phenomena have not been thoroughly investigated. Thus, with the difficulties of exploration coupled with lack of interest, it is not surprising that relatively few localities of fossiliferous clays or sands have been reported. For the majority of places given in TABLE 3, we are indebted to the early Canadian geologist, Bell, who, in speaking of the Churchill River says (3): "As the bank continued with the same characteristics for a long distance upstream, I have no doubt that shells may be found at a greater distance inland than that at which they were observed by myself."

It would seem, therefore, justifiable to extend the southern boundary of the marine invasion from the head of Hudson Bay, at least to within a comparatively short distance from the divide. This has been done on the map representing this submergence and the area involved indicated by horizontal lines.

Discussion of the Area Across the Height of Land between James Bay and the Ottawa Valley

Reference to the accompanying map will show that the region under discussion includes the Lake Temiskaming and Lake Abitibi districts, the two areas separated by the divide, the lowest point of which is 914 feet[1] above sea level and occurs just southwest of Lake Abitibi. Examination of the superficial covering of this intermediate area has shown that the entire region up to altitudes of 1000 feet (35) is overlain by clays which were water-laid, for Coleman (21) has shown that this region was once covered by a vast body of water, which he designated as Lake Ojibway.

On the large map certain elevations are shown which are based upon Fairchild's isobases and which, according to him, are theoretical elevations of marine waters (26, 27). These localities are represented by solid black triangles. Table 4 lists the above regions together with their altitudes and approximate locations.

Table 4

Location	Approx. Latitude	Approx. Longitude	Height in feet above sea level
Lake St. John	48° 30′	72° 15′	1000
Saint Anne River	47° 0′	72° 0′	970
Jacques Cartier River	47° 0′	71° 30′	950
Saint Lawrence Valley, Quebec	46° 50′	71° 10′	925
Montmorency, River Laval	47° 0′	71° 0′	940
Chateau Richer	47° 10′	70° 50′	925
Montreal	45° 30′	73° 50′	840
North River, Sainte Marguerite	46° 0′	74° 0′	880
West River, La Chute	45° 45′	74° 30′	825
Ottawa	45° 30′	75° 50′	700
Mattawa	46° 30′	78° 50′	700
North Bay	46° 20′	79° 30′	675

The 700-foot isobase extends from the Lake Temiskaming region southeastward along the Ottawa River and passes through Ottawa city. Since marine fossils have been found in the Grenville District, Ontario, up to 735 feet above sea-level (22), it must follow, if Fair-

[1] Elevation taken from "Altitudes in Canada," James White, Commission of Conservation, Canada.

child's isobase for 700 is correct, that the marine waters extended up to and included Lake Temiskaming, since at the present time the altitude of the lake is about 590 feet above sea level. Again, the topography of the Lake Temiskaming region is such as to make this highly probable. The area lies wholly within the Laurentian Plateau and may be divided into three sections: (1), rocky uplands; (2), clay belt; and (3), linear valleys. The linear valleys have been brought about by erosion along planes of faulting, and are probably pre-glacial, for as Wilson says: " . . . they cannot possibly be of post-Glacial origin because stream dissection since the Glacial epoch has been almost insignificant and the valleys are themselves occupied by glacial drift deposited by the ice-sheets. It is also very improbable that they are the result of glacial denudation, for they have no relationship to the character of the rocks they traverse, and they trend, in some cases, at right angles to the direction of ice movement. Since the valleys are neither Glacial nor post-Glacial in their origin, it follows, *a priori,* that they are pre-glacial valleys." The depression occupied by Lake Temiskaming and the Ottawa river between the lake and the village of Mattawa has a length of about 100 miles and a depth, in places, at present only 100 feet above sea level.

The 800-foot isobase extends from the region just north of Lake Temiskaming southeastward, crossing the St. Lawrence just west of Montreal, thence to Sherbrook where the line turns northeast, passing just north of Tring Junction in the Chaudière valley. Between this line and the 900-foot isobase occur many raised beaches, of which the following may be mentioned: that lying slightly to the northeast of Allumette Island at 800 feet; that at Lake Maskinonge at 865 feet; and at St. Jerome at 900 feet. In addition, still higher beaches have been described at Kingsmere Mountain (north of Ottawa) at 965 feet, and at La Chute at 1000 feet above sea level.

The extension of the northern margin of the previously discussed Champlain Submergence toward the north would thus seem justified, if Fairchild's isobases are substantially correct and these raised beaches are of marine origin. In further support of this extension of sea-margin, Taylor says in discussing the limit of post-glacial submergence in the highlands east of Georgian Bay: " . . . the facts show clearly that the same water that filled the ancient channels in the southern highlands extended far to the north and west. It

evidently covered all the lowlands of this region and, as indicated by the altitude of the shore line, made a strait over Lake Nipissing at least twenty-five miles wide and five hundred feet deep, and probably another farther north over the height of land to Hudson Bay." In a later paper Taylor says: "There can be no doubt of the recent presence of wide waters at high levels over Lake Nipissing and the headwaters of the Mattawa river. At the five places seen in the Ottawa valley, however, no clear and certain evidence of high level submergence was found, except, perhaps, the thin silts and clays overlying the drift south of Mattawa, up to about eight hundred feet. This limit for such a deposit would seem to imply a contemporary water surface at a still higher level, and it is more than probable that for a comparatively brief period such an eastward extension actually existed." One more note from Taylor's researches may not be amiss. In speaking of the history of the Great Lakes he says (60): "At their highest level, the Great Lakes had open connection with waters to the east through a broad strait at Nipissing, and it now seems possible that they had another to the northeast. It is not yet proved that these connections were with the ocean, but I believe that the evidence tends more and more strongly toward that conclusion." Coleman (21), in his discussion of Lake Ojibway, admits the possibility of this lake having been united to the sea; for he says " . . . whether any portion of the bed of Lake Ojibway was covered by the sea is uncertain."

Duration of the Submergences

Antevs (2) has estimated about 30,000 years as necessary for the retreat of the ice sheet from the terminal moraines in New York State to Cochrane, Ontario. The retreat from Stony Lake, Ontario (which on the map included in this paper would be located approximately at latitude 44° 30′, longitude 72°) to Mattawa, Ontario, required 13,000 years. According to his map (p. 164), the marine stage in the St. Lawrence Basin was inaugurated at the time the ice sheet stood at Stony Lake. He concludes his studies with the following statement: " . . . the last ice sheets had their greatest extent and began to wane about 40,000 years ago. This figure may be less than 10,000 years too large or too small . . . " If this is approximately correct it may be safely concluded that the ice disappeared from the Hudson Bay region about 35,000 years ago.

Since the retreat of ice from the terminal moraines of New York State to Stony Lake, Ontario, consumed 17,000 years, it follows that the Champlain submergence was inaugurated about 16,000 years B. C. This marine invasion was probably of considerable duration. Taylor (62) has shown in his paper entitled "New Facts on the Niagara Gorge" that the outlet at North Bay, Ontario, was closed by uplift about 3000 years ago. Mather (44) in his studies on the Champlain Sea in the Lake Ontario basin states: "That the uplift of the St. Lawrence region, in greater part at least, lagged considerably after the removal of ice." In further support of the length of life of the Champlain Submergence, Coleman says (20); "This inland sea must have existed for a long period because clay-forming sediments accumulated to a thickness of one hundred and fifty feet or more in some parts of the basin and filled up all the hollows and formed a fairly level sea-floor." Keele (38) substantiates this view, stating that the clay deposits of the St. Lawrence basin vary in thickness up to a maximum of about 200 feet.

In the Hudson Bay region marine fossils have been found up to approximately 500 feet above sea level. The evidence of raised beaches in this area further suggests that the marine waters stood about 700 feet higher than is the case at present. Uplift has thus taken place and, according to Bell (8), at the rate of five to ten feet per century. If uplift has been more or less uniform, the time consumed since this differential elevation began would be between 5000 and 14,000 years. That this land-elevation has been more or less uniform seems to be the case, for Ells (25) found that the thickness of moss and peat increased toward the south as follows: "Eight miles west of Moose Factory the moss and peat was two to three feet thick. Ten miles farther south, two to four feet, forty miles south, four and a half to five feet, sixty miles to eighty miles south, five and a half to six feet and ninety miles south, six to eight feet." It would be fairly safe to conclude, therefore, that at one time during the existence of these two marine invasions they were contemporaneous.

As pointed out earlier in this paper, the Lake Temiskaming and Lake Abitibi regions were also inundated, although perhaps for a shorter period of time than for the two submergences just discussed. Cooke (22) concludes from his studies of the Lake Temiskaming

region that the waters covering this area must have existed at least 2500 years. Furthermore, the clays of the Abitibi district (Lake Ojibway) are, according to Knight, Barrows, Hopkins, and Parsons (39), about seventy feet in thickness. If there is a correlation between the depth of deposition of clay and the length of life of a body of water, it follows that the waters over the height of land existed for a considerable length of time, since as already pointed out, the length of life of the Champlain Submergence was comparatively long, with a clay deposition of about two hundred feet.

From the foregoing discussion it would seem probable that a water-connection existed for at least a short period of time between the St. Lawrence Basin and Hudson Bay.

So far no marine fossils have been found in this intermediate region, although in places diligent search has been made (10). The absence of fossils, however, may be due to the great influx of fresh waters, in this area from the lakes to the west, through the strait at Nipissing and also from the retreating ice front. This influx would have made the waters of the invasion brackish and might have so modified the salt constituents as to have forbidden the presence of marine forms, or at least have reduced their numbers. This fact, supported by the comparatively short life of the probable marine connection, the erosion and the leaching out of the deposits and the possible presence of certain chemicals, which would militate against the preservation of shells, may account for the absence of fossiliferous clays and sands. Furthermore, as already noted, no living marine mollusks have been found in James Bay even though the connection with the sea is direct and the waters of the Bay brackish (9).

From the foregoing studies, it seems evident that it is justifiable to extend the northern margin of the St. Lawrence marine invasion to at least the region of Lake Temiskaming, and the southern margin of the Hudson Bay marine submergence to a point a few miles from the present height of land. Even if the intermediate region was not covered by marine waters, the two sea-margins were close enough to allow ordinary agents of local seed-dispersal to become operative and to bridge the gap, so that plants growing along the shores of the southern waters might establish themselves in the maritime habitats of the northern invasion.

Summary

If this theory of a marine connection between the St. Lawrence Basin and James Bay is correct, a pathway was open after the recession of the Wisconsin Ice Sheet for the migration of plants of maritime requirements from the south to James Bay along the shores of these inland seas. Two sources of evidence would aid tremendously in establishing this theory: namely, the finding of marine fossils in the intermediate zone and the persistence of some maritime plants in this interior region. As stated above, no fossiliferous marine clays have been found north of Mattawa until the marine deposits are met about one hundred and twenty-five miles south of James Bay.

In only one case have any halophytes been reported from the region under discussion and in this case the identification is open to doubt (35). This lack of halophytes in the interior is more or less to be expected, for unquestionably considerable erosion and leaching of the soil has occurred since the end of the marine stage, which would have changed the edaphic conditions enough to have forced these plants to abandon the region.

Olsson-Seffer (47) has shown that each species of plant has a maximum salt requirement to which it is very accurately adapted and that this maximum cannot be overstepped without fatal results to the plant. Thus, in the case of *Glaux maritima*, 2.7 *per cent* is the maximum; with *Juncus Gerardi*, 2.2 *per cent;* with *Triglochin maritima*, 2.6 *per cent*, and with *Elymus arenarius*, 2.6 per cent. It naturally follows that there must be a minimum salt requirement for halophytes, and since the maximum in most cases is relatively slight, the leaching out of this amount after land-elevation took place would not require a very long period of time. As was noted earlier in this paper, the halophytes under discussion do not now occur in much of the region which was known to have been submerged and whose soil about the margin of the sea unquestionably supported these plants for a time after land-elevation. Svenson (56) has pointed out that the occurrence of several of these maritime plants about the Finger Lakes region of New York State is due to the presence of salt springs, rather than to salt deposits during the Champlain Submergence.

Nevertheless, the occurrence of raised beaches all along the St. Lawrence Basin at altitudes up to 1000 feet, the raised beaches along the east coast of James Bay, the isobases of Fairchild, the depth

of clay-deposits and the occurrence of maritime plants in the Hudson Bay region all lend strong support to the theory that there existed after the Wisconsin glaciation a marine connection between Hudson Bay and the St. Lawrence Basin, and Guppy (34) is probably correct in saying: "The witness of the living plant is often quite as insistent as the testimony of the rocks."

Conclusion

From the above studies the following statements seem justified:

1. A marine invasion occurred in the St. Lawrence Basin after the recession of the Wisconsin Ice Sheet, which probably extended north to include the Lake Temiskaming region.

2. A similar invasion of the sea occurred in the Hudson Bay region contemporaneous with that of the St. Lawrence Basin, which extended southward to within a few miles of the height of land.

3. Evidence seems to indicate that a possible marine connection existed between these two known submergences involving the Lake Abitibi area.

4. Driftless areas have never been found in the Hudson Bay region so that it is improbable that these plants existed within the district during the Wisconsin glaciation.

5. Wind, water and animals do not seem to be the chief factors which brought about the introduction of these halophytes into the Hudson Bay area.

6. The above marine connection (if it existed) would have offered suitable conditions for the migration of halophytic plants along its shores.

7. Undoubtedly the northern margin of the Champlain Sea and the southern margin of the Hudson Bay inundation were relatively close and, even though a marine connection may have been lacking, the factors effecting local plant-distribution may have been sufficient to have bridged the slight gap and thus account for the occurrence of the plants in question in the region of Hudson Bay.

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The New Hampshire Record for Rynchospora Torreyana.—In the Gray Herbarium there is a specimen received as part of the herbarium of William Boott, correctly identified as *Rynchospora Torreyana* Gray and bearing the data: "Bogs, East Washington, N. H. No. 41 *Legit C. F. Parker*, 1868." When the 7th edition of Gray's Manual was being prepared the label was accepted at its face value and the locality there recorded. *R. Torreyana* occurs as a member of the relic Coastal Plain flora in southeastern Rhode Island, on Cape Cod and on Nantucket; and since the Coastal Plain *Sclerolepis verticillata* (Walt.) BSP. had just been found[1] at its first station north of southern New Jersey, on a pond-shore in Bradford, the town adjoining East Washington on the east, the *Rynchospora* was, very naturally, interpreted as a second species of the New Jersey Pine Barrens which had persisted as a relic in south-central New Hampshire. In September, 1928, familiar with *R. Torreyana* as it grows in Washington County,

[1] F. T. Lewis, Rhodora, vii. 186 (1905).

Rhode Island and on Cape Cod, I joined Dr. H. K. Svenson in a search for the plant at Parker's reputed station in New Hampshire. Our failure was recorded in 1929.[1] Subsequently, others, especially Mr. Ludlow Griscom, with his insatiable impulse to locate rare plants, have sought for the *Rynchospora* without success; and the conviction has, naturally, developed that there was some error in the record.

Reëxamination of the material said to come from East Washington shows at once that it was not labeled by Parker himself. The specimen bears a slip with Parker's "41," but the label is wholly in the hand of Scribner on a form with the caption "Ex Herb. F. Lamson Scribner." Further study of the material of *R. Torreyana* by Mr. Griscom and myself reveals the fact that the specimen in question is quite inseparable, in the very dark basal sheaths, the degree of discoloration of the blades, the method of folding, the peculiar state of development and unusually small and very dark spikelets, from specimens labeled in Parker's own hand "Side of Railroad, Atsion, N. J., Sept. 26, '67." Our interpretation is, that Parker, collecting this material in September, 1867, sent some of it to Scribner as no. 41, and that soon thereafter, through a confusion of data, a specimen was labeled by Scribner as collected at East Washington in 1868 and passed on to William Boott. Mr. Bayard Long, who has sought at Philadelphia, where more of C. F. Parker's specimens are found, has been unable to find any East Washington material. In view of the facts here presented *Rynchospora Torreyana* should be removed from the list of Coastal Plain relics in New Hampshire.—M. L. Fernald.

British Seaweeds.[2]—The available handbooks of the Seaweeds are few and in America their number is notably limited. American algologists, whether technical students of the Marine Algae or more amateurish students of Seaweeds, will, therefore, welcome the newest work, a detailed and beautifully illustrated book of 478 pages by Dr. Lily Newton, Professor of Botany at University College, Aberystwyth. Published by the Trustees of the British Museum and thus gaining indorsement of its authoritative quality, already assured by its authorship, the book is exquisitely printed on superior paper and the figures are most satisfactorily reproduced. Analytical keys abound and the generic and specific diagnoses are clearly stated and not too long for ready understanding. With

[1] Svenson, Rhodora, xxxi. 97 (1929).

[2] A Handbook of the British Seaweeds. By Lily Newton, Ph.D., F.L.S. . . . . With 270 Figures in the Text. London. The Trustees of the British Museum (Natural History), Cromwell Road, S.W. 7. 1931. Price 15 shillings.

Professor Newton's work as a guide, renewed study of our own marine algae should result. The marine forms of New England and of old England are sufficiently similar so that many of the names in the British handbook are familiar to those who have followed the eastern American work of Farlow, Hervey, Collins, Setchell and Holden. In the Algae, as in the Bryophytes and the Lichens, an authoritative work on British species is indispensible to all serious workers in America. The new handbook will, consequently, be needed by many American students.— M. L.F.

ON THE NOMENCLATURE OF ELODEA

C. A. WEATHERBY

FOR many years most standard works have used for the waterweeds of North and South America the name *Elodea* Michx. Fl. Bor. Am. i. 20 (1803). The one exception has been that followers of the American Code have employed Rafinesque's substitute name *Philotria*.

Under the old International Rules *Elodea* could be retained. It differed from *Elodes* Adans. (1763) by the required "one letter" "in the termination" (Art. 58); and the earlier Elodeas of Jussieu (1789) and Ventenat (1799) were variants of Adanson's name, ascribed to him, were therefore illegitimate and could be disregarded. But under the homonym rule adopted at the Cambridge Congress in 1930 illegitimacy, in cases like this, is glorified. Dogs-in-the-manger are sanctified; a name which can never be used in the sense in which it was proposed can prevent the use of the same name in another sense, even though it may have been long established and without impediment therein. Thus a large number of serviceable and familiar names, *Elodea* among them, are, unreasonably, wiped out.

Elodea, then, passes, to the accompaniment of eight new combinations. In choosing its successor, taxonomic considerations come into play. If the genus is taken in the sense of Caspary, Bentham & Hooker, Engler & Prantl and Dalla Torre & Harms, to include both dioecious and hermaphrodite species, the earliest available name applicable to any part of it is *Anacharis* Rich., proposed in a paper read before the Institute at Paris Jan. 14, 1812, and published in Part 2 of the Mémoires de la Classe des Sciences Mathematiques et Physiques for 1811, which is usually dated 1812, but according to Caspary[1] was not actually issued until 1814. *Philotria*, Rafinesque's renaming of *Elodea* Michx. because of "Elodea" Adans., did not arrive until

[1] Pringsh. Jahrb. Wiss. Bot. 425 (1858).

January, 1818; ANACHARIS, therefore, becomes the correct name for the genus.

Victorin, however, in a clearly reasoned and, as always with him, delightfully written paper (Contr. Bot. Lab. Univ. Montréal xviii (1931)) has revived Richard's division of the group (in the Memoir above mentioned) into two genera, *Elodea* (now become *Philotria*) with hermaphrodite flowers and three stamens and *Anacharis*, dioecious and with nine stamens in the male flowers. Since all the North American species are at least normally dioecious, ANACHARIS is still the correct name for them under this interpretation.

There remains, however, a question of typification. In the original publication of *Elodea*, by Richard's statement really his genus and not Michaux's, the flowers were described in detail as hermaphrodite. The one species regularly cited (though the then unpublished *E. guyannensis* is casually referred to in a note), *E. canadensis*, is dioecious. Victorin argues that the description was drawn, not from *E. canadensis*, known to Richard only from Michaux's rather fragmentary dried specimens, but from *E. guyannensis*, which Richard had seen and studied in the field in French Guiana in 1789. Victorin, therefore, takes *E. guyannensis* as typical of the genus and, as above noted, restricts the application of *Philotria* to the hermaphrodite South American species.

This interpretation has great historical probability; but there will be those who will argue against it somewhat as follows. Richard, misled by the great morphological similarity of the pistillate flowers of *E. canadensis* to the bisexual flowers of *E. guyannensis*. and by the presence of staminodia in the former, doubtless believed he was describing *E. canadensis* in his generic diagnosis. The error was the easier because he knew neither the staminate flowers of *E. canadensis* nor the pistillate flowers of *Anacharis* which was founded solely on male material of a single species. There are many instances of morphological misinterpretation in early literature which are not allowed to affect the application of names clearly placed by citation of species. In any case, definiteness is, in nomenclature, a far brighter jewel than historical probability; what an author actually did, even if mistakenly, is a much surer basis for typification than what one thinks he thought. Richard actually cited *E. canadensis* under *Elodea;* Britton designated it as the type of the taxonomically identical *Philotria;* it should remain the type.

Under this interpretation, Richard, in his second publication, unwittingly shifted the application of *Elodea*. His *Anacharis* is, in effect, a renaming of his first *Elodea*. His second *Elodea* becomes a later homonym of the first; *Philotria*, a later synonym of *Anacharis*. The South American hermaphrodite species have to take the name *Apalanthe* Planch. Ann. Sci. Nat. ser. 3, xi. 75 (1849). But Anacharis again steps forth as the correct appellation for the North American species!

By whichever of the three possible taxonomic approaches, then, one goes at the matter, the nomenclatural conclusion is the same—an uncommonly and unexpectedly happy result.

Gray Herbarium.

Another Localized Variety of Bidens heterodoxa. —Bidens heterodoxa (Fernald) Fernald & St. John, var. **atheistica**, var. nov., *B. heterodoxam* et var. *orthodoxam* Fern. & St. John valde simulans; acheneis exterioribus 4–4.8 mm. longis interioribus 5–7 mm. longis strigosis, aristis nullis vel perbrevibus antrorse barbellulatis.—Quebec: tidal mud and slaty gravel by the St. Lawrence, Berthier, Co. Bellechasse, September 14, 1931, *Fernald*, no. 2952; tidal mud of the St. Lawrence, Anse St. Vallier, Co. Bellechasse, September 15, 1931, *Fernald*, nos. 2955 (type in Gray Herb.), 2960.

Bidens heterodoxa, originally from tidal mud on Prince Edward Island, has normally developed awns, though antrorsely barbellate; var. *orthodoxa* of the Magdalen Islands is quite similar, but with retrorsely barbed awns; var. *agnostica* Fernald, known at a single station in Connecticut, has the long awns smooth and polished, not barbed. Another variety, from the same Connecticut station, var. *monardaefolia* Fernald, has long retrorsely barbed awns and leaves much broader and less saliently toothed than in the northern varieties. Var. *atheistica*, essentially without awns, has the foliage, involucres and other characters quite as in typical *B. heterodoxa*.

The occurrence of an awnless *Bidens* on the broad and deeply flooded tidal flats of the St. Lawrence is peculiarly interesting, in view of the occurrence with it of the wholly anomalous *Epilobium ecomosum* (Fassett) Fernald, Rhodora, xxxiv. 39 (1932), an estuarine species quite lacking the coma which is found in all other species of *Epilobium*. To those who profess not to believe in *adaptations* and *survival of the fittest*, these two cases are specially commended; in the tidal flats regu-

larly flooded twice a day by water so deep as to justify the construction of extensive fish-weirs the plumose coma and the retrorsely barbed awns are of no use in distributing the species.

Not all the species of *Bidens* in the estuary of the St. Lawrence, however, have lost their retrorsely barbed awns. *B. hyperborea* in several forms is there, though *B. frondosa* is chiefly (if not entirely) represented by the var. *anomala* Porter, with antrorsely barbellate awns. On the broad tide-covered swales at Ste. Anne de Beaupré I got perfectly characteristic *B. Eatoni* Fernald, var. *fallax* Fernald, the first station for the variety except in the estuary of the Merrimac in Massachusetts and the first for any form of the species from north of the coast of New England.

I made very extensive collections of these and several other plants of the St. Lawrence estuary, especially at Ste. Anne de Beaupré and at Anse St. Vallier. Unfortunately the packages, sent by parcel post to be finally dried at the Gray Herbarium, ran into obstructions at the United States customs and were *six weeks* between Quebec and Boston. There are few duplicates fit for distribution. —M. L. Fernald, Gray Herbarium.

Does Juncus bulbosus occur in Massachusetts?—One of the most distinctive species of *Juncus* is the widely dispersed Atlantic European and Macronesian *J. bulbosus* L. (*J. supinus* Moench, *J. uliginosus* Roth), a weak perennial with many decumbent or repent culms from the hardened base; the flowers and fruits somewhat as in *J. acuminatus* Michx., with 3 stamens, blunt petals, and blunt capsules; the glomerules, when leaning or falling into very wet places, quickly proliferous and developing plumes of many leaves. The plant was collected early in the last century in southeastern Newfoundland, by Bachelot de la Pylaie, and it was definitely listed from there in the *Monographie des Vrais Joncées* by Laharpe: "Elle habite les marais fangeux ou sablonneux, à Terre-Neuve!"[1] In 1890, however, in his *Monographia Juncacearum*, Buchenau stated that its range included only Europe, Algeria, Tunis, Madeira and the Azores, and suggested that the la Pylaie material is more probably *J. acuminatus* (which does not grow in Newfoundland): "Ob *J. supinus* in Neu-Fundland vorkommt, wo de la Pylaie ihn gesammelt haben soll,

[1] Laharpe, Mém. Soc. d'Hist. Nat. Par. iii. 135 (1827).

bedarf noch weiterer Beobachtungen (vergl. die Anmerkungen zu *J. supinus* und zu *J. acuminatus*)."[1] More recent botanists, beginning with Waghorne, have, however, collected the species and now all doubt of its American occurrence is removed; it is abundant about or in sandy or peaty pools and depressions in southeastern Newfoundland, on St. Pierre et Miquelon and on Sable Island, nearly one hundred miles off Nova Scotia.

The object of this note is to stimulate search for *Juncus bulbosus* in Massachusetts, not as a mere random proposition, but because, in the herbarium of the British Museum there is a perfectly typical specimen of it bearing the original and very characteristic label of Thomas Nuttall: "*Juncus uliginosus*. Mass." Here, indeed is a challenge. Is *J. bulbosus* another of the highly localized relics of an early migration along the continental shelf between southern New England and Newfoundland? The number of such cases known is considerable. The number of western Eurasian types also indigenous in Newfoundland is augmented by every serious exploration. Several of the latter species are also in Nova Scotia or in eastern Massachusetts, while a few are native in Nova Scotia or in eastern Massachusetts (or adjacent areas) but not yet known from Newfoundland: such species as *Potamogeton polygonifolius* Pourret (Nfld., Miq., Sable I.); *Puccinellia maritima* (Huds.) Parl. (N. S., s. Me. to R. I.); *Sieglingia decumbens* (L.) Bernh. (Nfld., N. S.); *Agropyron pungens* (Pers.) R. & S. (N. S., s. Me. to Cape Cod); *Carex Hostiana* DC. (var. *laurentiana* Fern. & Wieg.) (Nfld., Miq., Antic. I., Tewksbury, Mass.); *Juncus effusus*, var. *conglomeratus* (L.) Engelm. (Nfld., Miq., N. S., se. Conn.); *Polygonum Raii* Bab. (Nfld., Miq., N. S., etc.); *Ranunculus Flammula* L. (Nfld., Miq., N. S.,) and *Potentilla procumbens* Sibth. (Nfld., N. S.).

Although Nuttall, a century ago, may have found *Juncus bulbosus* on one of the outer sands which have subsequently disappeared, it is worth while to keep it in mind. There are plenty of sandy and peaty depressions in eastern Massachusetts where it may still linger.—M. L. Fernald.

An estuarine Variety of Mimulus ringens.—In September, 1916, Mr. Bayard Long and I collected extensively on the tidal mudflats of the Penobscot and Kennebec systems in Maine. On the tidal

[1] Buchenau in Engl. Bot. Jahrb. xii. 293 (1890).

mud at Bangor we got a very characteristic extreme of *Mimulus ringens* L., with greatly shortened internodes, unusually short leaves, and peduncles and calices much shorter than in the plant of ordinary inland shores and meadows. In September, 1931, I saw the same extreme development on several tidal shores of the St. Lawrence from above the city of Quebec to several miles below. The material, closely matching that from the Penobscot estuary, stands so clearly apart from typical *M. ringens* that I am separating it as

Mimulus ringens L., var. **colpophilus**, var. nov., simplex vel subsimplex, internodiis 1.5–2.5 cm. longis; foliis oblongis subacutis vel obtusis plerumque 2.5–5 cm. longis; pedunculis 1–1.7 cm. longis; calycibus maturis 8–10 mm. longis.—Quebec: tidal mud of the St. Lawrence below the mouth of Chaudière River, September 15, 1931, *Fernald*, no. 2543 (type in Gray Herb.); and noted in other parts of the estuary northeastward to Co. Bellechasse. Maine: tidal mud-flats of the Penobscot, Bangor, September 7, 1916, *Fernald & Long*, no. 14,501.

In typical *Mimulus ringens* L. and in the southern var. *minthodes* (Greene) Grant the internodes are usually elongate, the middle and upper ones mostly 3–7 cm. long, the principal leaves (except in obviously dwarfed individuals) 5–13 cm. long, the lowest peduncles 2–4.5 cm. long and the mature calyx 1.3–2 cm. long. Var. *colpophilus* is not to be confused with var. *congestus* Farw. Rep. Mich. Acad. Sci. xix. 249 (1917). The type-number of the latter, represented in the Gray Herbarium, has the long and remote acuminate leaves and the large calyx of typical *M. ringens*, with peduncles shorter than the average.—M. L. Fernald, Gray Herbarium.

Victorin's Les Spadiciflores du Québec.[1]—Continuing the interesting and valuable series of monographs which will one day form a complete flora of Quebec, Frère Marie-Victorin has recently published this new contribution on *Araceae* and *Lemnaceae*, grouped together as *Spadiciflores*. As in the previous monographs, the descriptions bring together not only the morphological details necessary for classification, but notes on the derivation of Latin and vernacular names, palaeobotany, distribution, bio-ecology, pathology, folklore, and other interesting facts about the plants considered. Especially interesting is the carefully worked out differentiation between *Arisaema triphyllum* and *A. Stewardsonii*. Carefully drawn plates by Frère Alexandre help much to make this clear. In fact, the illustrations are uniformly good, and the distribution maps as well. Six half-tone plates of different phases in the life of *Symplocarpus*,

[1] Les Spadiciflores du Quebec. Par Frère Marie-Victorin. 60 pages, 27 figures. 1931. $.75. (Contrib. Lab. Bot. Univ. Montréal, No. 19.)

as "*cliché*" by Frère Adrien are very pleasing. The treatment of the three species of *Lemnaceae* found in Quebec summarizes what various previous students have discovered, as well as Frère Victorin's own researches. Careful drawings by Frère Réole show all the details of these small retrograde plants. Although credit is given to other authorities, a brief bibliography of sources would prove helpful to other students continuing the study of the group.—Clarence Hinckley Knowlton, Hingham, Massachusetts.

Flora of the North Shore of the Gulf of St. Lawrence.[1]—Dr. Harrison Lewis, for several years officially engaged in ornithological work for the Department of the Interior of Canada, had an unusual opportunity to visit many of the innumerable islands which fringe the southern coast of the Labrador Peninsula. Happily, his second interest was botanical, and with an eye for novelties and for problems of local distribution, he made extensive collections upon which he now reports. As a supplement to the earlier study by St. John (1922) of the same region Lewis's paper is important. The first part discusses in a novel way the factors (decomposing molluscs, marine salts, etc.) which supply calcareous habitats for local colonies of plants in prevailingly acid areas. In the list itself 567 vascular plants are enumerated, several of them not previously reported from the North Shore, others notable range extensions, and a few decidedly thrilling discoveries: *Sparganium glomeratum*, a Lapland species heretofore of only doubtful status in America; *Salix simulans*, a local endemic; *S. paraleuca*, heretofore known only from the southern side of the Gaspé Peninsula; *Sedum villosum*, discovered by St. John at its first known American stations south of Greenland, now found to extend for 42 miles along the coast. A number of nomenclatural transfers are made, so that those who do not have access to the Annotated List as it appeared serially will need the reprint. Others, who wish merely to keep track of botanical exploration in northeastern America will also want the reprint. Its modest price makes it available to all.—M. L. F.

[1] Lewis, Harrison F. *An Annotated List of Vascular Plants collected on the North Shore of the Gulf of St. Lawrence, 1927–1930* by Harrison F. Lewis. Reprinted from Canadian Field-Naturalist, vol. xlv. Reprint issued by H. C. Miller, 175 Nepean St., Ottawa, Ont. *Price* 45c.

Volume 34, no. 401, including pages 69 to 96, was issued 4 May, 1932.

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